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European Technical Assessment

ETA 17/0185 of 02/10/2017

Technical Assessment Body issuing the ETA: Technical and Test Institute for Construction Prague	
Trade name of the construction product	Rawlplug R-HPTIIA4 Stainless Steel Throughbolts
Product family to which the construction product belongs	Product area code: 33 Torque controlled expansion anchor for use in cracked and uncracked concrete
Manufacturer	Rawlplug S.A. Ul. Kwidzyńska 6 51-416 Wrocław Poland
Manufacturing plant	Manufacturing Plant No 2
This European Technical Assessment contains	12 pages including 10 Annexes which form an integral part of this assessment
This European Technical Assessment is issued in accordance with regulation (EU) No 305/2011, on the basis of	EAD 330232-00-0601 Mechanical fasteners for use in concrete
This version replaces	ETA 17/0185 issued on 20/03/2017
This version is a corrigendum to	ETA 17/0185 of 02/10/2017

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1. Technical description of the product

The Rawlplug R-HPTIIA4 Stainless Steel Throughbolts are through-fixing torque-controlled expansion anchors in sizes of M8, M10, M12 and M16. Each type comprises a special bolt with a taper, an expansion sleeve, a hexagonal nut and a washer. The anchors are made from A4 grade stainless steel.

The anchor is installed in a drilled hole; tightening the nut draws the cone into the sleeve. The expansion of this sleeve applies the anchorage.

The installed anchor is shown in Annex 1.

2. Specification of the intended use in accordance with the applicable EAD

The performances given in Section 3 are only valid if the anchor is used in compliance with the specifications and conditions given in Annex B.

The provisions made in this European Technical Assessment are based on an assumed working life of the anchor of 50 years. The indications given on the working life cannot be interpreted as a guarantee given by the producer, but are to be regarded only as a means for choosing the products in relation to the expected economically reasonable working life of the works.

3. Performance of the product and references to the methods used for its assessment

3.1 Mechanical resistance and stability (BWR 1)

Essential characteristic	Performance
Characteristic resistance (static and quasi-static loading)	See Annex C 1 and C 2
Displacement	See Annex C 1 and C 2
Characteristic resistance for seismic performance category C1	See Annex C 4

3.2 Safety in case of fire (BWR 2)

Essential characteristic	Performance
Reaction to fire	Class A1 according to EN 13501-1
Resistance to fire	Seen Annex C 3

4. Assessment and verification of constancy of performance (AVCP) system applied with reference to its legal base

According to the Decision 97/463/EC of the European Commission[1], the system 1 of assessment verification of constancy of performance (see Annex V to the Regulation (EU) No 305/2011) apply.

5. Technical details necessary for the implementation of the AVCP system, as provided in the applicable EAD

Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited at Technical and Test Institute for Construction Prague.

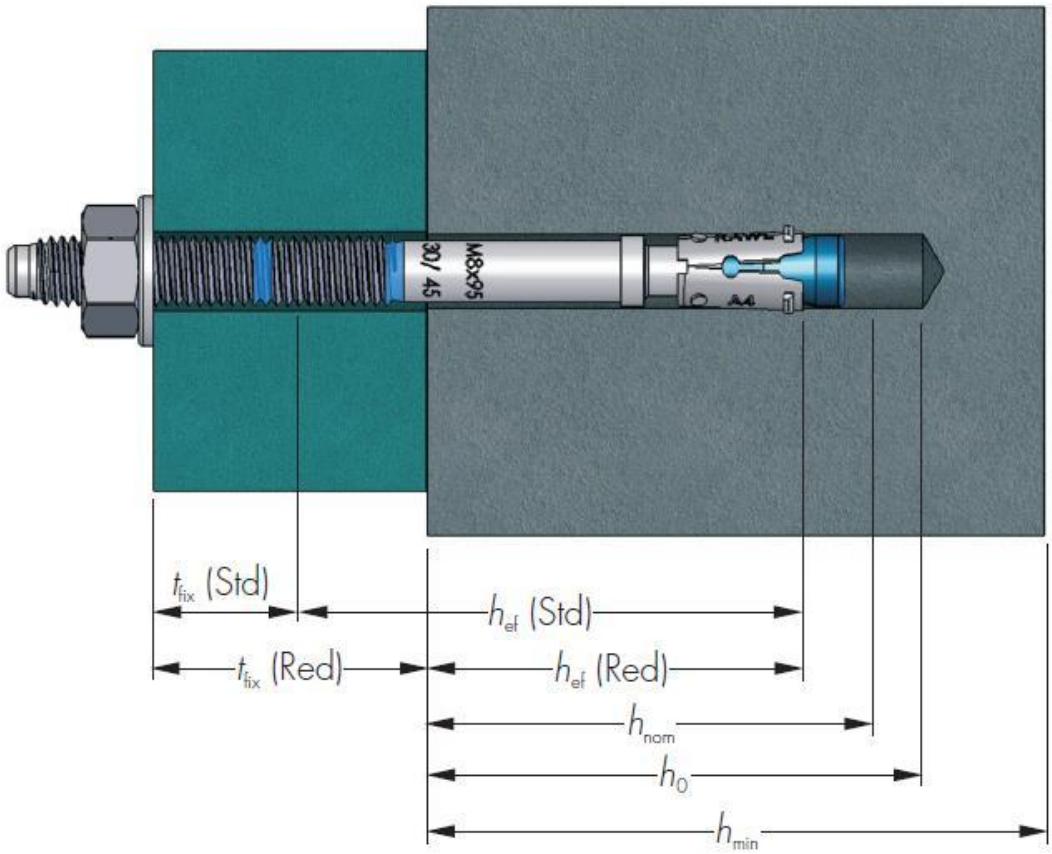
Issued in Prague on 02.10.2017

By

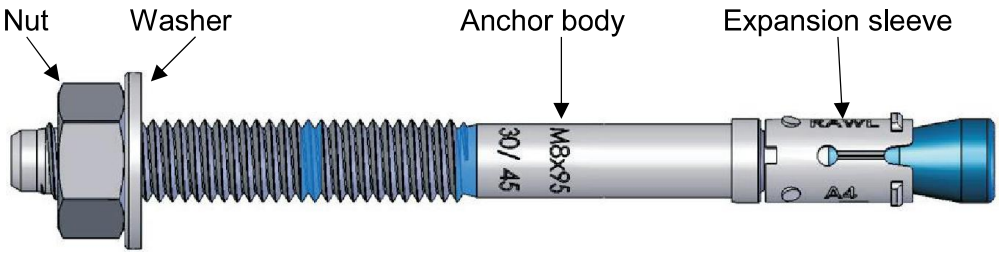
Ing. Mária Schaan
Head of the Technical Assessment Body

[1] Official Journal of the European Communities L 198/31 25.7.1997

Rawlplug R-HPTIIA4 Stainless Steel Throughbolts - Installed anchor



Rawlplug R-HPTIIA4 Stainless Steel Throughbolts - components



Rawlplug R-HPTIIA4 Stainless Steel Throughbolts	
Product description Installed conditions and components	**Annex A 1**

Table A1 - Materials

Component	Material
Anchor body	Steel rod on coil cold forged bolts Steel grade 1.4578, according EN 10263-5
Expansion sleeve	Steel grade 1.4401, according EN 10088-2
Hexagonal nut	according DIN 934
Washer	according DIN 125A or DIN 9021

Table A2 – Material properties

Component		M8	M10	M12	M16
Anchor body – ultimate tensile strength	[N/mm^2]	600-700	600-700	550-650	550-650
Expansion sleeve – ultimate tensile strength	[N/mm^2]	530-680	530-680	530-680	530-680

Table A3 – Marking

M8														
Bolt length [mm]	60	65	75	80	85	90	95	100	105	115	120	140	150	160
Head marking	B	b	C	d	D	e	E	F	f	G	H	K	L	M
Bolt marking	-/10	-/15	10/25	15/30	20/35	25/40	30/45	35/50	40/55	50/65	55/70	75/90	85/100	95/110

M10											
Bolt length [mm]	65	80	85	90	95	115	120	130	140	150	180
Head marking	B	D	d	e	E	G	H	J	K	L	P
Bolt marking	-/5	-/20	5/25	10/30	15/35	35/55	40/60	50/70	60/80	70/90	100/120

M12																		
Bolt length [mm]	80	100	105	110	115	120	125	135	140	150	160	180	200	220	240	250	260	280
Head marking	D	F	f	G	g	h	H	J	K	L	M	P	R	S	T	U	V	X
Bolt marking	-/5	5/25	10/30	15/35	20/40	25/45	30/50	40/60	45/65	55/75	65/85	85/105	105/125	125/145	145/165	155/175	165/185	185/205

M16													
Bolt length [mm]	100	105	125	130	140	150	160	180	200	220	250	280	300
Head marking	F	f	H	J	K	L	M	P	R	S	U	X	Y
Bolt marking	-/5	-/10	5/25	10/30	20/40	30/50	40/60	60/80	80/100	100/120	130/150	160/180	180/200

Specifications of intended use

Anchorages subject to:

- Static and quasi-static load.
- Fire exposure
- Seismic performance category C1

Base materials

- Cracked or uncracked concrete.
- Reinforced or unreinforced normal weight concrete of strength class C20/25 at minimum and C50/60 at maximum according EN 206-1:2000-12.

Use conditions (Environmental conditions)

- Structures subject to dry internal conditions.
- Structures subject to external atmospheric exposure (including industrial and marine environment) or exposure to permanently damp internal condition, if no particular aggressive conditions exist.

Note: Particular aggressive conditions are e.g. permanent, alternating immersion in seawater or the splash zone of seawater, chloride atmosphere of indoor swimming pools or atmosphere with extreme chemical pollution (e.g. in desulphurization plants or road tunnels where de-icing materials are used).

Design:

- The anchorages are designed in accordance with the FprEN 1992-4:2016 and EOTA Technical Report TR 055, December 2016 under the responsibility of an engineer experienced in anchorages and concrete work.
- Verifiable calculation notes and drawings are prepared taking account of the loads to be anchored. The position of the anchor is indicated on the design drawings.
- Anchorages under seismic actions (cracked concrete) have to be designed in accordance with FprEN 1992-4:2016 and EOTA Technical Report TR 055, December 2016.
- Anchorages under fire exposure have to be designed in accordance with FprEN 1992-4:2016 and EOTA Technical Report TR 055, December 2016.

Installation:

- Anchor installation carried out by appropriately qualified personnel and under the supervision of the person responsible for technical matters of the site.
- Use of the anchor only as supplied by the manufacturer without exchanging any components of the anchor.
- Anchor installation in accordance with the manufacturer's specifications and drawings using the appropriate tools.
- Effective anchoring depth, edge distance and spacing not less than the specified values without minus tolerance.
- In case of aborted drill hole: new drilling at a minimum distance away of twice the depth of the aborted hole or smaller distance if the aborted drill hole is filled with high strength mortar and if under shear or oblique tension load it is not in the direction of load application.

Table B1 - Installation parameters

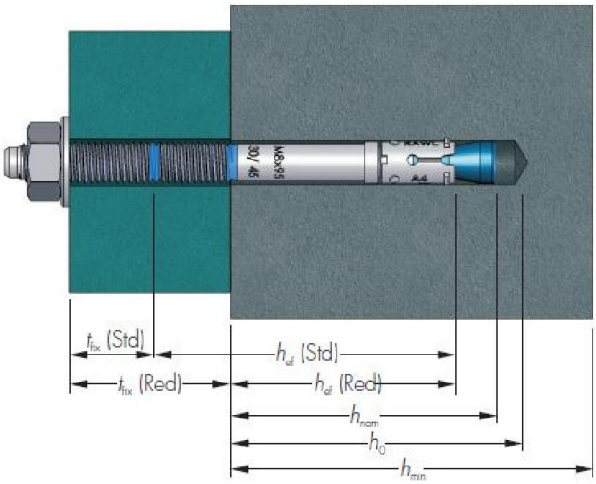
Size	Drill hole diameter	Bolt length	Thread length	Hole diameter in fixture	Standard embedment				Reduced embedment				Installation torque
					Min. hole depth	Nominal embedment depth	Effective embedment depth	Max. fixture thickness	Min. hole depth	Nominal embedment depth	Effective embedment depth	Max. fixture thickness	
	d_0 [mm]	l [mm]	l_G [mm]	d_f [mm]	h_0 [mm]	h_{nom} [mm]	h_{ef} [mm]	t_{fix} [mm]	h_0 [mm]	h_{nom} [mm]	h_{ef} [mm]	t_{fix} [mm]	T_{inst} [N.m]
M8	8	60	25	9	-	-	-	-	50	40	32	10	15
		65	30	9	-	-	-	-	50	40	32	15	
		75	35	9	65	55	47	10	50	40	32	25	
		80	40	9	65	55	47	15	50	40	32	30	
		85	45	9	65	55	47	20	50	40	32	35	
		90	50	9	65	55	47	25	50	40	32	40	
		95	55	9	65	55	47	30	50	40	32	45	
		100	60	9	65	55	47	35	50	40	32	50	
		105	65	9	65	55	47	40	50	40	32	55	
		115	75	9	65	55	47	50	50	40	32	65	
		120	80	9	65	55	47	55	50	40	32	70	
		140	100	9	65	55	47	75	50	40	32	90	
		150	100	9	65	55	47	85	50	40	32	100	
		160	100	9	65	55	47	95	50	40	32	110	
M10	10	65	21	11	-	-	-	-	59	49	39	5	30
		80	31	11	-	-	-	-	59	49	39	20	
		85	36	11	79	69	59	5	59	49	39	25	
		90	41	11	79	69	59	10	59	49	39	30	
		95	46	11	79	69	59	15	59	49	39	35	
		115	66	11	79	69	59	35	59	49	39	55	
		120	71	11	79	69	59	40	59	49	39	60	
		130	81	11	79	69	59	50	59	49	39	70	
		140	91	11	79	69	59	60	59	49	39	80	
		150	101	11	79	69	59	70	59	49	39	90	
		180	100	11	79	69	59	100	59	49	39	120	
M12	12	80	30	13	-	-	-	-	70	60	48	5	50
		100	40	13	90	80	68	5	70	60	48	25	
		105	45	13	90	80	68	10	70	60	48	30	
		110	50	13	90	80	68	15	70	60	48	35	
		115	55	13	90	80	68	20	70	60	48	40	
		120	60	13	90	80	68	25	70	60	48	45	
		125	65	13	90	80	68	30	70	60	48	50	
		135	75	13	90	80	68	40	70	60	48	60	
		140	80	13	90	80	68	45	70	60	48	65	
		150	90	13	90	80	68	55	70	60	48	75	
		160	100	13	90	80	68	65	70	60	48	85	
		180	100	13	90	80	68	85	70	60	48	105	
		200	100	13	90	80	68	105	70	60	48	125	
		220	100	13	90	80	68	125	70	60	48	145	
		240	100	13	90	80	68	145	70	60	48	165	
		250	100	13	90	80	68	155	70	60	48	175	
		260	100	13	90	80	68	165	70	60	48	185	
		280	100	13	90	80	68	185	70	60	48	205	
M16	16	100	30	18	-	-	-	-	90	80	65	5	100
		105	35	18	-	-	-	-	90	80	65	10	
		125	45	18	110	100	85	5	90	80	65	25	
		130	50	18	110	100	85	10	90	80	65	30	
		140	60	18	110	100	85	20	90	80	65	40	
		150	70	18	110	100	85	30	90	80	65	50	
		160	80	18	110	100	85	40	90	80	65	60	
		180	100	18	110	100	85	60	90	80	65	80	
		200	100	18	110	100	85	80	90	80	65	100	
		220	100	18	110	100	85	100	90	80	65	120	
		250	100	18	110	100	85	130	90	80	65	150	
		280	100	18	110	100	85	160	90	80	65	180	
		300	100	18	110	100	85	180	90	80	65	200	

Table B2 - Installation parameters – Minimum spacing and edge distance

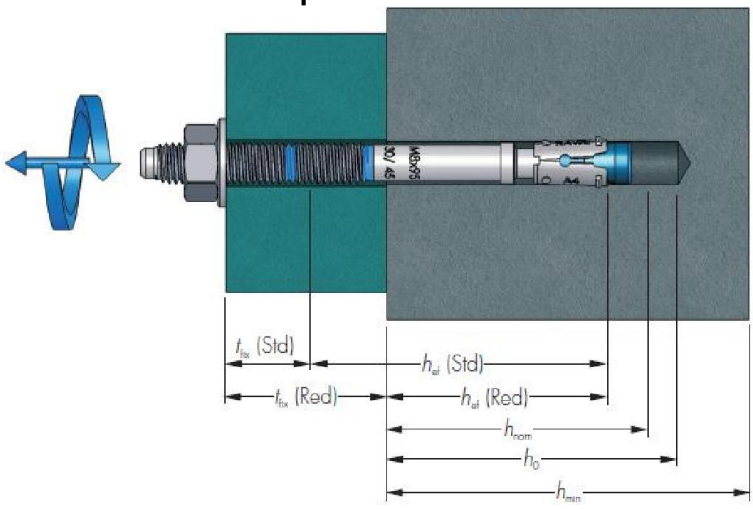
Size			M8		M10		M12		M16	
			Red[1)]	Std	Red[1)]	Std	Red	Std	Red	Std
Minimum thickness of concrete member	h_{min}	[mm]	100	100	100	120	100	140	130	170
Minimum spacing and edge distance in cracked concrete										
Minimum spacing	s_{miin}	[mm]	50	55	70	70	120	90	150	135
for edge distance	c ≥	[mm]	50	55	70	70	95	75	100	105
Minimum edge distance	c_{min}	[mm]	40	40	50	45	70	55	85	70
for spacing	s ≥	[mm]	80	70	120	90	150	140	200	200
Minimum spacing and edge distance in uncracked concrete										
Minimum spacing	s_{min}	[mm]	50	55	70	70	120	90	150	135
for edge distance	c ≥	[mm]	50	55	70	70	95	75	100	105
Minimum edge distance	c_{min}	[mm]	50	40	60	50	70	55	90	80
for spacing	s ≥	[mm]	50	100	70	115	120	125	150	200

[1)] Use restricted to anchoring statically indeterminate structural components

Pre-torque installation



Post-torque installation



Rawlplug R-HPTIIA4 Stainless Steel Throughbolts	
Intended use Installation parameters	**Annex B 3**

Installation instructions

1.

Drill a hole of required diameter and depth

2.

Clear the hole of drilling dust and debris
(using blowpump or equivalent method)

3.

Lightly tap the throughbolt through the fixture into hole with a hammer, until fixing depth is reached

4.

Tighten to the recommended torque

5.

Assembled condition of anchor

Rawlplug R-HPTIIA4 Stainless Steel Throughbolts	
Intended use Installation instructions	**Annex B 4**

Table C1 – Characteristic resistance under tension load

Steel failure										
Size			M8		M10		M12		M16	
			Red[1)]	Std	Red[1)]	Std	Red	Std	Red	Std
Characteristic resistance	$N_{Rk,s}$	[kN]	21,2		33,6		44,8		82,6	
Partial safety factor	γ_{Ms}	[-]	1,5		1,5		1,5		1,5	

Pull-out failure										
Characteristic resistance in cracked concrete C20/25	$N_{Rk,p}$	[kN]	3,0	6,0	7,5	9,0	9,0	12,0	16,0	25,0
Characteristic resistance in uncracked concrete C20/25	$N_{Rk,p}$	[kN]	7,5	9,0	12,0	16,0	-[2)]	25,0	-[2)]	-[2)]
Installation safety factor	γ_{inst}	[-]	1,2	1,2	1,2	1,0	1,0	1,0	1,0	1,0
Increasing factor										
Cracked and uncracked concrete C30/37	ψ_c	[-]	1,07	1,16	1,07	1,26	1,16	1,23	1,18	1,18
Cracked and uncracked concrete C40/50	ψ_c	[-]	1,13	1,33	1,13	1,52	1,32	1,45	1,37	1,37
Cracked and uncracked concrete C50/60	ψ_c	[-]	1,20	1,50	1,20	1,78	1,49	1,67	1,55	1,55

Concrete cone failure										
Factor for concrete cone failure for cracked concrete	$k_{cr,N}$	[-]	7,7							
Factor for concrete cone failure for uncracked concrete	$k_{ucr,N}$	[-]	11,0							
Installation safety factor	γ_{inst}	[-]	1,2	1,2	1,2	1,0	1,0	1,0	1,0	1,0
Effective anchorage depth	h_{ef}	[mm]	32	47	39	59	48	68	65	85
Spacing	$s_{cr,N}$	[mm]	96	141	117	177	144	204	195	255
Edge distance	$c_{cr,N}$	[mm]	48	71	59	89	72	102	98	128

Splitting failure										
Spacing	$s_{cr,sp}$	[mm]	160	240	200	300	250	340	320	430
Edge distance	$c_{cr,sp}$	[mm]	80	120	100	150	125	170	160	215
Installation safety factor	γ_{inst}	[-]	1,2	1,2	1,2	1,0	1,0	1,0	1,0	1,0

[1)] Use restricted to anchoring statically indeterminate structural components

[2)] Pull-out failure mode is not decisive

Table C2 – Displacement under tension load

Size			M8		M10		M12		M16	
			Red[1)]	Std	Red[1)]	Std	Red	Std	Red	Std
Tension load in cracked concrete	N	[kN]	1,2	2,4	3,0	4,3	4,3	5,7	7,6	11,9
Displacement	δ_{N0}	[mm]	1,1	0,5	0,5	1,2	0,8	1,0	0,2	1,0
	$\delta_{N\infty}$	[mm]	1,8	1,3	0,8	1,2	1,0	1,3	0,6	1,1
Tension load in uncracked concrete	N	[kN]	3,0	3,6	4,8	7,6	8,0	11,9	12,6	18,8
Displacement	δ_{N0}	[mm]	0,1	0,3	0,2	0,2	0,1	0,5	0,3	0,5
	$\delta_{N\infty}$	[mm]	0,8	1,3	0,8	1,2	1,0	1,3	0,6	1,1

[1)] Use restricted to anchoring statically indeterminate structural components

Table C3 – Characteristic resistance under shear load

Steel failure without lever arm										
Size			M8		M10		M12		M16	
			Red[1)]	Std	Red[1)]	Std	Red	Std	Red	Std
Characteristic resistance	$V^0_{Rk,s}$	[kN]	11,7		18,5		24,6		45,4	
Ductility factor	k_7	[-]	0,8		0,8		0,8		0,8	
Partial safety factor	γ_{Ms}	[-]	1,25		1,25		1,25		1,25	

Steel failure with lever arm										
Characteristic resistance	$M^0_{Rk,s}$	[Nm]	22		45		72		180	
Partial safety factor	γ_{Ms}	[-]	1,25		1,25		1,25		1,25	

Concrete pry-out failure										
Factor	k_8	[-]	1,0	1,0	1,2	1,0	1,0	2,0	2,0	2,0
Installation safety factor	γ_{inst}	[-]	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0

Concrete edge failure										
Effective length of anchor	ℓ_f	[mm]	32	47	39	59	48	68	65	85
Anchor diameter	d_{nom}	[mm]	8		10		12		16	
Installation safety factor	γ_{inst}	[-]	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0

[1)] Use restricted to anchoring statically indeterminate structural components

Table C4 – Displacement under shear load

Size			M8		M10		M12		M16	
			Red[1)]	Std	Red[1)]	Std	Red	Std	Red	Std
Shear load in cracked and uncracked concrete	V	[kN]	6,7	6,7	5,8	10,6	14,1	14,1	25,9	25,9
Displacement	δ_{V0}	[mm]	3,0	3,0	1,5	2,7	2,5	2,5	2,2	2,2
	$\delta_{V\infty}$	[mm]	4,5	4,5	2,2	4,1	3,8	3,8	3,8	3,3

[1)] Use restricted to anchoring statically indeterminate structural components

Table C5 – Characteristic values of resistance to tension load under fire exposure[1)]

Size			M8		M10		M12		M16	
			Red[2)]	Std	Red[2)]	Std	Red	Std	Red	Std
Characteristic fire resistance duration at 30 minutes										
Steel failure	$N_{Rk,s,fi}$	[kN]	0,7	0,7	1,5	1,5	2,5	2,5	4,7	4,7
Pull-out failure	$N_{Rk,p,fi}$	[kN]	0,8	1,5	1,9	2,3	2,3	3,0	4,0	6,3
Concrete cone failure	$N_{Rk,c,fi}$	[kN]	1,0	2,7	1,7	4,8	2,9	6,9	6,1	12,0
Characteristic fire resistance duration at 60 minutes										
Steel failure	$N_{Rk,s,fi}$	[kN]	0,6	0,6	1,2	1,2	2,1	2,1	3,9	3,9
Pull-out failure	$N_{Rk,p,fi}$	[kN]	0,8	1,5	1,9	2,3	2,3	3,0	4,0	6,3
Concrete cone failure	$N_{Rk,c,fi}$	[kN]	1,0	2,7	1,7	4,8	2,9	6,9	6,1	12,0
Characteristic fire resistance duration at 90 minutes										
Steel failure	$N_{Rk,s,fi}$	[kN]	0,4	0,4	0,9	0,9	1,7	1,7	3,1	3,1
Pull-out failure	$N_{Rk,p,fi}$	[kN]	0,8	1,5	1,9	2,3	2,3	3,0	4,0	6,3
Concrete cone failure	$N_{Rk,c,fi}$	[kN]	1,0	2,7	1,7	4,8	2,9	6,9	6,1	12,0
Characteristic fire resistance duration at 120 minutes										
Steel failure	$N_{Rk,s,fi}$	[kN]	0,4	0,4	0,8	0,8	1,3	1,3	2,5	2,5
Pull-out failure	$N_{Rk,p,fi}$	[kN]	0,6	1,2	1,5	1,8	1,8	2,4	3,2	5,0
Concrete cone failure	$N_{Rk,c,fi}$	[kN]	0,8	2,2	1,4	3,9	2,3	5,5	4,9	9,6
Spacing	$s_{cr,N}$	[mm]	$4 \times h_{ef}$							
	s_{min}	[mm]	50	55	70	70	120	90	150	135
Edge distance	$c_{cr,N}$	[mm]	$2 \times h_{ef}$							
	c_{min}	[mm]	$c_{min} = 2 \times h_{ef}$ however if the fire attack is from more than one side, the edge distance of the anchor has to be ≥ 300 mm and ≥ $2 \times h_{ef}$							

[1)] In absence of other national regulations the partial safety factor for resistance under fire exposure. $\gamma_{M,fi} = 1,0$ is recommended

[2)] Use restricted to anchoring statically indeterminate structural components

Table C6 – Characteristic values of resistance to shear load under fire exposure

Size			M8		M10		M12		M16	
			Red[1)]	Std	Red[1)]	Std	Red[)]	Std	Red	Std
Characteristic fire resistance duration at 30 minutes										
Steel failure without lever arm	$V_{Rk,s,fi}$	[kN]	0,7		1,5		2,5		4,7	
Steel failure with lever arm	$M_{Rk,s,fi}$	[Nm]	0,7		1,9		3,9		10,0	
Characteristic fire resistance duration at 60 minutes										
Steel failure without lever arm	$V_{Rk,s,fi}$	[kN]	0,6		1,2		2,1		3,9	
Steel failure with lever arm	$M_{Rk,s,fi}$	[Nm]	0,6		1,5		3,3		8,3	
Characteristic fire resistance duration at 90 minutes										
Steel failure without lever arm	$V_{Rk,s,fi}$	[kN]	0,4		0,9		1,7		3,1	
Steel failure with lever arm	$M_{Rk,s,fi}$	[Nm]	0,4		1,2		2,6		6,7	
Characteristic fire resistance duration at 120 minutes										
Steel failure without lever arm	$V_{Rk,s,fi}$	[kN]	0,4		0,8		1,3		2,5	
Steel failure with lever arm	$M_{Rk,s,fi}$	[Nm]	0,4		1,0		2,1		5,3	
Concrete pry-out failure										
Factor[2)]	k_8	[-]	1,0	1,0	1,2	1,0	1,0	2,0	2,0	2,0
Concrete edge failure	The characteristic resistance $V^0_{Rk,c,fi}$ in concrete C20/25 to C50/60 is determined by: $V^0_{Rk,c,fi} = 0,25 \times V^0_{Rk,c(\leq 90)}$ and $V^0_{Rk,c,fi} = 0,20 \times V^0_{Rk,c(\leq 120)}$ with the initial value of the characteristic resistance $V^0_{Rk,c}$ in cracked concrete C20/25 under normal temperature									

[1)] Use restricted to anchoring statically indeterminate structural components

[2)] The values of factor k_8 and relevant values of $N_{Rk,c,fi}$ given in the Table C5 have to be considered in the design

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Performances
Characteristic values of resistance under fire exposure

Annex C 3

Table C7 – Characteristic values of resistance under seismic action category C1

Size			M8		M10		M12		M16	
			Red[1)]	Std	Red[1)]	Std	Red[1)]	Std	Red[1)]	Std
Tension load										
Steel failure										
Characteristic resistance	$N_{Rk,s,eq}$	[kN]	21,2		33,6		44,8		82,6	
Partial safety factor	$\gamma_{Ms,eq}$	[-]	1,5		1,5		1,5		1,5	
Pull-out failure										
Characteristic resistance in concrete C20/25	$N_{Rk,p,eq}$	[kN]	3,0	6,0	7,5	9,0	9,0	12,0	16,0	25,0
Installation safety factor	$\gamma_{inst,eq}$	[-]	1,2	1,2	1,2	1,0	1,0	1,0	1,0	1,0
Shear load										
Steel failure without lever arm										
Characteristic resistance	$V^0_{Rk,s,eq}$	[kN]		6,7		12,5	18,4		39,0	
Partial safety factor	$\gamma_{Ms,eq}$	[-]	1,25		1,25		1,25		1,25	

[1)] Use restricted to anchoring statically indeterminate structural components